particularly, to an electrode structure of a PDP with a small discharge gap.

2. Description of the Prior Art

A plasma display panel (PDP) is one kind of flat display using gas discharges to create brilliant images. Advantages of the PDP include thin and lightweight design, large display size, and wide viewing angle. The luminescent principle of the PDP involves the production of ultraviolet (UV) rays by plasma first, followed by irradiation of the UV rays to produce visible light. The production efficiency of plasma greatly influences the luminescent efficiency of the PDP. The luminescent efficiency of the PDP can be improved by many methods. For example, increasing UV production can improve the luminescent efficiency of the PDP, but increasing the luminescent efficiency of the fluorescence material is difficult. Nowadays, change of the filling gas and the electrode structure of the PDP will increase the UV production.--

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2. Please substitute the paragraphs of page 3, lines 20-24 with the following paragraphs:

--BRIEF SUMMARY OF THE INVENTION

An objective of the present invention is to provide an electrode structure of a plasma display panel with a reduced discharge gap.--

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3. Please substitute the paragraphs of page 5, line 26 to page 13, line 11 with the following paragraphs:

--DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

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Please refer to Fig.4A to Fig.4G, which are the cross-sectional views of the electrode structures of a PDP 30 in the present invention. As shown in Fig.4A, the electrode structure is formed on a front substrate 32 of the PDP 30. The electrode structure includes a first sustaining electrode 34, a second sustaining electrode 36, a first auxiliary electrode 44, and a second auxiliary electrode 42. The first sustaining electrode 34 and second sustaining electrode 36 are formed on the surface of the front substrate 32 and a first gap 38 is defined between these electrodes. In addition, the first auxiliary electrode 44 has a first part 44a formed on the surface of the front substrate 32 in the first gap 38, a second part 44b formed above the first sustaining electrode 34, and a third part 44c for connecting the first part 44a and the second part 44b. The second auxiliary electrode 42 is formed above the second sustaining electrode 36. A second gap 48 is defined between the first part 44a of the first auxiliary electrode 44 and the second sustaining electrode 36 and the second gap 48 is a discharge gap. As shown in the top view, the first sustaining electrode 34 and the second sustaining electrode 36 are parallel to the first auxiliary electrode 44 and the second auxiliary electrode 42.

Besides, the PDP 30 also includes a back substrate (not shown) parallel to the front substrate 32. A plurality of ribs 50 are formed on the back substrate,

parallel to and spaced apart from each other with equal distance. A third part 44c of the first auxiliary electrode 44 is perpendicular to the first sustaining electrode 34 and the second sustaining electrode 36, and parallel to the ribs 50. Further, the third part 44c of the first auxiliary electrode 44 is in opposition to the ribs 50 on the back substrate to avoid the reduction of the transparency of the PDP 30.

The first sustaining electrode 34 and second sustaining electrode 36 are transparent electrodes and formed of indium tin oxide (ITO). The resistance of ITO is very large and easily affects the discharge efficiency. Therefore, an auxiliary electrode composed of Cr/Cu/Cr alloy is used to reduce the resistance. Moreover, a smaller discharge gap 48 is formed between the sustaining electrode 36 and the first part 44a of the auxiliary electrode 44 in the first gap 38 so that the problem in the prior art can be solved by reducing the firing voltage to increase the quality of the PDP 30.

As shown in Fig.4B, the difference between Fig.4B and Fig.4A is the position of the second part 44b of the first auxiliary electrode 44. In Fig. 4B, the second part 44b is located on the surface of front substrate 32 rather than on the sustaining electrode 34 in Fig. 4A. As well, the second part 44b of the first auxiliary electrode 44 can be located on both surfaces of the first sustaining electrode 34 and the front substrate 32.

As shown in Fig.4C, the first part 44a of the first auxiliary electrode 44 can be formed in the first gap 38 and adjacent to the first sustaining electrode 34. As a result, the distance between the first auxiliary electrode 44 and the second sustaining electrode 36 is shortened to a second gap 48. The second gap 48 is smaller than the first gap 38 for achieving the objective of reducing the firing voltage in the present invention.

AB Cont'5

As shown in Fig.4D, the front substrate 32 of the PDP 30 includes an electrode structure having a first sustaining electrode 34, a second sustaining electrode 36, and a first auxiliary electrode 40. The first sustaining electrode 34 and the second sustaining electrode 36 are formed on the surface of the front substrate 32, and a first gap 38 is defined therebetween. The first auxiliary electrode 40 is electrically connected to the first sustaining electrode 34. The first sustaining electrode 34 includes a first side 341 and a second side 342, the first side 341 is near the second sustaining electrode 36, and the second side 342 is far away from the second sustaining electrode 36. Besides, the first auxiliary electrode 40 includes a first part 40a, a second part 40b, and a third part 40c. The first part 40a is formed on the surface of the front substrate 32 in the first gap 38, the second part 40b is formed on the first sustaining electrode 34 adjacent to the first side 341, and the third part 40c is positioned near the second side 342 of the first sustaining electrode 34. The first auxiliary electrode 40 and the second sustaining electrode 36 are separated by a second gap 48. The width of the second gap 48 is

A3 Cont.

smaller than that of the first gap 38 for achieving the purpose of voltage reduction in the present invention. The third part 40c of the first auxiliary electrode 40 is formed above the first sustaining electrode 34 and approaching to the second side 342 of the first sustaining electrode 34. The third part 40c of the first auxiliary electrode 40 can also be positioned on the surface of the front substrate 32 (not shown), or above the first sustaining electrode 34 and the front substrate 32 at the same time. The first auxiliary electrode 40 also includes a fourth part 40d positioned between the second part 40b and the third part 40c. The position of the fourth part 40d is opposite to the ribs 50 on the back substrate (not shown), so the transparency of the PDP 30 will not be reduced by the fourth part of the auxiliary electrode 40d. In addition, each part of the first auxiliary electrode 40 can be electrically connected. A second auxiliary electrode 42 is also formed above the second sustaining electrode 36 to reduce the resistance of the second sustaining electrode 36.

As shown in Fig.4E, the first auxiliary electrode 40 includes only the first part 40a and the second part 40b. The first part is formed in the first gap 38, and the second part 40b is located above the first sustaining electrode 34 and adjacent to the first side 341 of the first sustaining electrode 34. Both the third 40c and fourth part 40d are omitted in this embodiment to increase the transparency of the entire front substrate 32.

A3 cont.

As shown in Fig.4F, a first auxiliary electrode 44 and a third auxiliary electrode 45 are positioned between the first sustaining electrode 34 and the second sustaining electrode 36. The first auxiliary electrode 44 electrically connects to the first sustaining electrode 34 via a connecting electrode 52a and the third auxiliary electrode 45 electrically connects to the second sustaining electrode 36 via a connecting electrode 52b. A first gap 38 is defined between the first sustaining electrode 34 and the second sustaining electrode 36. The first auxiliary electrode 44 and the third auxiliary electrode 45 are both located on the first gap 38. A second gap 48 is defined between the first auxiliary electrode 44 and the second sustaining electrode 36, and a third gap 46 is defined between the third auxiliary electrode 45 and the first sustaining electrode 43. The widths of the third gap 46 and the second gap 48 are both smaller than that of the first gap 38 formed by the first sustaining electrode 34 and the second sustaining electrode 36. Therefore, the purpose of reducing the firing voltage of the PDP 30 is again achieved.

As shown in Fig.4G, two L-sharp first sustaining electrode 34 and second sustaining electrode 36 are formed in opposition to each other on the surface of the front substrate 32. A first gap 38 is further defined between the first sustaining electrode 34 and the second sustaining electrode 36. A first auxiliary electrode 44 is formed on the surface of the front substrate 32 in the first discharge gap 38 and the first auxiliary electrode 44 is formed adjacent to the first sustaining

A3 Cont.

electrode 34. In addition, a second auxiliary electrode 42 is formed on the surface of the second sustaining electrode 36. The second sustaining electrode 36 has different distances to the first auxiliary electrode 44 for forming a second gap 48 and a third gap 58, respectively. The first auxiliary electrode 44 is electrically connected to the first sustaining electrode 34 and the second auxiliary electrode 42 is electrically connected to the second sustaining electrode 36. The second gap 48 and the third gap 58 are both smaller than the first gap 38. Therefore, the smaller discharge gaps 48, 58 can be used to reduce the firing voltage of the PDP 30. In addition, the first auxiliary electrode 44 can be simultaneously arranged on the surface of the front substrate 32 as well as on the first sustaining electrode 34.

In this embodiment, two lithographic processes are used to form these sustaining electrodes 34, 36 and these auxiliary electrodes 40,44, 42, respectively. Therefore, a smaller discharge gap 58 is obtained by properly arranging the relative position of these auxiliary electrodes 40, 42, 44 and these sustaining electrodes 34, 36.

Please refer to Fig.5A and Fig.5B. Fig.5A and Fig.5B are the cross-sectional views of another embodiment of a PDP 60 according to the present invention. As shown in Fig.5A, the PDP 60 has a front substrate 62 and an electrode structure including a sustaining electrode 64, a first auxiliary electrode 66, a second auxiliary electrode 68, and a third auxiliary electrode 70. The

A3 cont.

sustaining electrode 64 is formed on the surface of the front substrate 62. The first auxiliary electrode 66 is also formed on the surface of the front substrate 62 and parallel to the sustaining electrode 64. A first gap exists between the sustaining electrode 64 and a first auxiliary electrode 66. A second auxiliary electrode 68 is also positioned on the surface of the front substrate 62 and parallel to the sustaining electrode 64. A second gap 72 exists between the sustaining electrode 64 and the second auxiliary electrode 68. The second gap 72 is smaller than the first gap 78, therefore, the firing voltage of the PDP 60 can be reduced.

The sustaining electrode 64 has a first side 641 near the second auxiliary electrode 68 and a second side 642 far from the second auxiliary electrode 68. The third auxiliary electrode 70 is located near the second side 642 of the sustaining electrode 64.

There is no sustaining electrode formed beneath the first 66 and the second 68 auxiliary electrodes. As shown in Fig.5A, two connecting electrode 76 are formed between the first auxiliary electrode 66 and the second auxiliary electrode 68 for electrically connecting the two auxiliary electrodes 66,68. Besides, the PDP 60 includes a back substrate (not shown) positioned parallel to the front substrate 62, and a plurality of ribs 74 formed on the back substrate 62. The connecting electrodes 76 are positioned in opposite and parallel to the ribs 74 for avoiding the reduction of the transparency of the PDP 60.

Further, the connecting electrode 76 can be omitted for simplifying the fabricating process and increasing the transparency of the PDP 60. The first auxiliary electrode 66 and the second auxiliary electrode 68 will not be connected in the same pixel area, but rather, can be connected in the pad area (not shown) at the edge of the PDP 60.

A3 cont.

As shown in Fig.5B, in order to increase the discharge efficiency of the PDP 60, a fourth auxiliary electrode 67 is further formed on the surface of the front substrate 32. The fourth auxiliary electrode 67 is positioned between the first 66 and the second 68 auxiliary electrodes. A first gap 78 exists between the first auxiliary electrode 66 and the sustaining electrode 64, a second gap 72 exists between the second auxiliary electrode 68 and the sustaining electrode 64, and the third gap 79 exists between the fourth auxiliary electrode 67 and the sustaining electrode 64. The second gap 72 and the third gap 79 are smaller than the first gap 78. The second gap 72, which is the smallest gap, is the discharge gap of the PDP 60.

In this embodiment, a sustaining electrode 64 and plurality of auxiliary electrodes 66, 67, 68, 70 are used for obtaining a smaller discharge gap 72 between the auxiliary electrode 68 and sustaining electrode 64.

Compared with the prior art, the present invention uses the misalignment of two electrodes to obtain a

smaller discharge gap. A first lithographic process is first used to form the sustaining electrodes and a second lithographic process is further used to form the auxiliary electrodes on the surface of the sustaining electrodes and near the sustaining electrodes. Therefore, the discharge gap formed by the auxiliary electrode and the nearby sustaining electrode is not limited by the resolution of the traditional exposure tools or the characteristics of the photoresist materials. A smaller discharge gap can be obtained to improve the image quality of the PDP.

Those skilled in the art will readily observe that numerous modifications and alterations of the device may be made while retaining the teachings of the invention. Accordingly, the above disclosure should be construed as limited only by the metes and bounds of the appended claims.--

4. Please substitute the paragraphs from page 19, lines 1 to 11 with the following paragraphs:

-- ABSTRACT OF THE DISCLOSURE

An electrode structure of a plasma display panel (PDP) is disclosed. The electrode structure is formed on a front substrate of the PDP. The electrode structure includes a first sustaining electrode, a second sustaining electrode, and an auxiliary electrode. The first and second sustaining electrodes are formed on the substrate with a first gap existing therebetween. The auxiliary electrode is formed in the first gap.